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CARTRIDGE FOR PRACTICE FIRING

Filed March 10, 1964

FIG. 1.

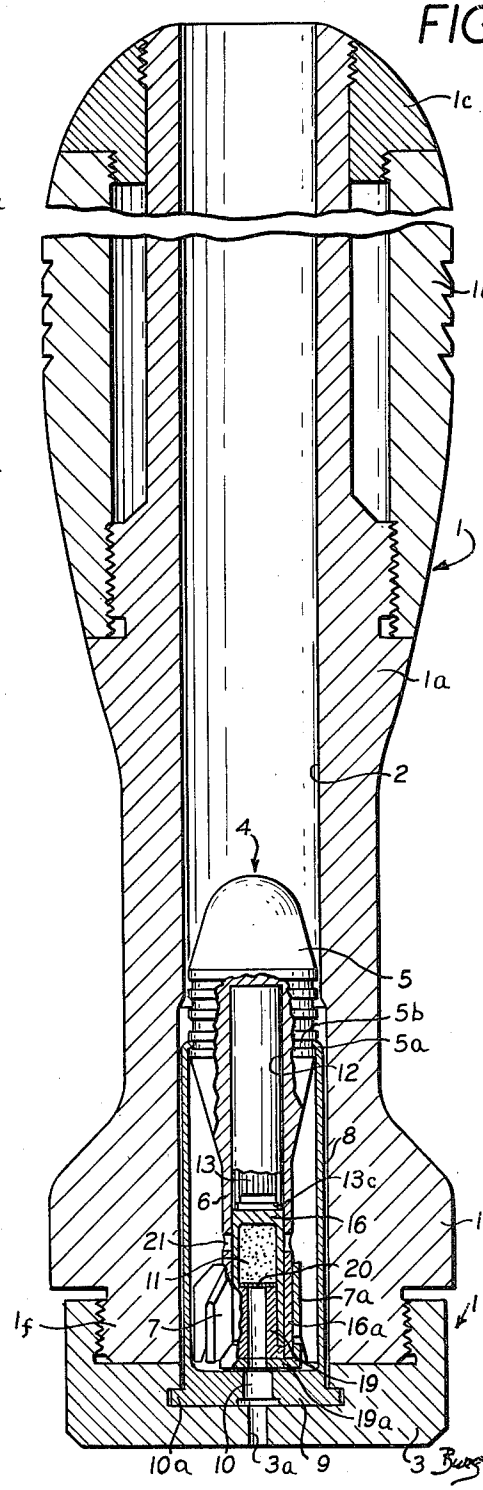


FIG. 2.

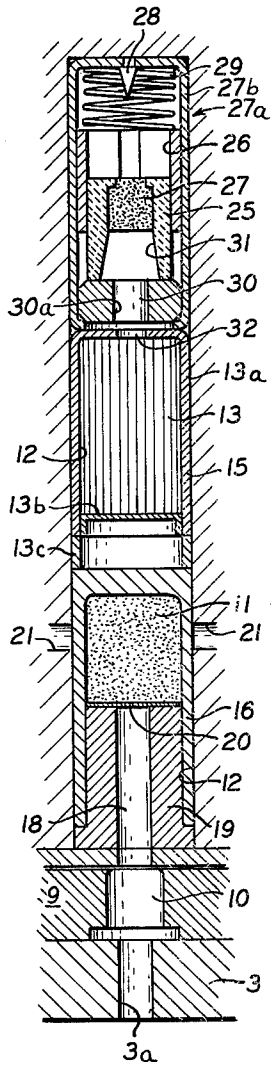
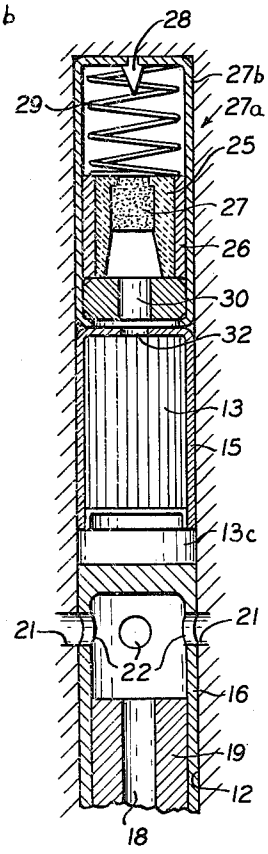


FIG. 3.



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3,211,098
CARTRIDGE FOR PRACTICE FIRING

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8 Claims. (Cl. 102—41)

This application is a continuation-in-part of application Serial No. 221,774, filed September 6, 1962, now abandoned.

This invention relates to a cartridge for practice firing of a gun such as a mortar.

It has been proposed heretofore to employ for practice firing a cartridge smaller than the normal cartridge for a weapon so as to provide for practice firing at a reduced cost. Thus, it has been proposed to provide a dummy cartridge of full size for a given weapon, and having a bore of a size to accommodate the small practice cartridge. The dummy cartridge with the practice cartridge in place therein is provided in place in the weapon, and the practice cartridge is fired through the bore of the dummy cartridge.

It is a principal object of the invention to provide a cartridge for practice firing of improved construction and which can be used in shell throwers such as mortars. Another principal object of the invention is to provide in a cartridge for practice firing means for indicating the point at which the projectile strikes. Other objects will be apparent from the following description.

The cartridge of the invention comprises a projectile having a leading end and a trailing end, and an axially extending bore. A signal generating charge is disposed in the bore adjacent the leading end thereof. This charge is for ignition upon impact of the projectile occurring when the projectile strikes. Further, there is positioned in the axial bore a propelling charge adjacent the trailing end. This charge is suitable for propelling the projectile into a trajectory upon the firing of the cartridge. According to the invention, a container is provided for the propelling charge, the container having an end wall disposed adjacent the signal charge, and side walls extending from the end wall toward the trailing end of the cartridge. The container is of such size and construction that it fits loosely in the axial bore following combustion of the propelling charge so as to permit passage of signal material from the signal charge, through the axial bore toward the trailing end, upon ignition of the signal charge. Radially extending openings can be provided in the sides of the projectile opposite the side walls of the propelling charge container. Such openings communicate the bore with the outside of the container for discharge of signal material from the container. Further, or alternatively, the projectile can include releasable retaining means which limit movement of the propelling charge container toward the trailing end of the axial bore, and means for releasing such retaining means following impact of the projectile when the projectile strikes. For example, an end cup can be positioned over the trailing end of the projectile, the cup being secured by friction to the body of the projectile, and such friction fit being of a tightness suitable to retain the cup in place on the projectile until a rearwardly directed force is impressed thereon due to ignition of the signal charge. Such force can serve to release the cup from the body of the projectile. The rearward force can then be utilized to force the propelling charge container rearwardly in the axial bore, whereby to expose radially extending openings in the projectile or to eject the container from the axial bore, so that the signal material may stream from the axial bore and perform its indicating function.

The practice shell can further include safety means for preventing accidental detonation of the signal charge. Further, the practice shell includes a casing therefor. The casing has a closed end and an open end closed by the practice projectile, which is connected to the casing at the casing open end, by means which release the practice shell from the casing upon combustion of the propelling charge.

The invention is further described in reference to the accompanying drawings, of which:

FIG. 1 is a cross-sectional view in elevation depicting a charge for practice firing according to the invention;

FIG. 2 and FIG. 3 are enlarged views of a portion of the practice shell, both views being in elevation and in cross-section, and depicting, respectively, conditions before firing and after firing.

In the various views of the drawings, like reference characters refer to corresponding parts.

A charge for practice firing includes dummy cartridge **1**, which can be loaded into a weapon in the usual manner, and which is of a size equal or about equal to the size of the usual shell used in the weapon. The dummy cartridge includes a body portion **1***a* and side wall portion **1***b*, threaded onto the body portion and further includes the head **1***c* at the leading end of the charge threaded onto the side wall portion **1***b* and the body portion **1***a*. An axially extending bore **2** extends from the leading end of the dummy charge to adjacent the trailing end **1***d*. The trailing end **1***d* includes an outwardly flared portion **1***e* and the threaded stub **1***f*. A cap **3** is threaded onto the stub **1***f* and closes the axial bore **2**. The cap **3** has a small axially positioned bore hole **3***a* for entrance of a firing pin (not shown).

Within the axial bore **2**, adjacent the trailing end thereof, is a cartridge **4**. The cartridge **4** includes a projectile made up of warhead **5**, which is formed integrally with a body **6**. The body **6** is provided with an axially extending bore **12** which extends from the warhead **5** rearwardly through the body. Within the bore hole **12** is a signal charge **13** and a propelling charge **11**. The propelling charge **11** is contained in a container **16** having rearwardly extending side walls **16***a*. The end wall of the container adjacent the signal charge **13** is thick relative to the side walls **16***a* of the container. A spacer **17**, which can be a ring, separates the signal charge and the container. Within the container and extending along the rearwardly extending side walls **16***a* thereof, is a retaining sleeve **19**, and atop the retaining sleeve is a rupturable disc **20**, which, upon exploding of propelling charge, is ruptured permitting gases to issue axially through the retaining sleeve to provide a rocket-like propelling action to the practice shell projectile. A cap **19***a* retains the retaining sleeve in place in the bore hole **12**. Eventually, as is described in detail hereinafter, the cap **19***a*, retaining sleeve **19**, and the propelling charge container **16** are expelled from the bore hole channel **12**. The practice shell further includes the control surfaces **7** which are integral with a control surface sleeve **7***a*. The sleeve **7***a* fits tightly about the casing **6**, so as to secure the control surface **7** in place on the projectile.

The projectile is contained within a casing **8**. The casing has an open end through which the warhead **5** projects, and it is provided with inturned bed **5***a* which engages a groove **5***b* so as to releasably secure the projectile in the casing. The closed end of the casing **9** is provided with a percussion cap **10** and flanges **10***a* which are received in the cap **3** in a manner so that the casing is retained in place in the bore **2** of the dummy cartridge **1** for practice firing.

The projectile body 6, opposite the propelling charge 11, is provided with radially extending perforations 21, which communicate the inside of the projectile bore 12 with the outside thereof. The container 16 for the propelling charge is formed of a material, for example a thermoplastic material, which, upon exploding of the propeller charge, will rupture opposite the perforations 21, whereby to communicate the perforations 21 with the gases resulting from the exploding of the propelling charge. The gases are then free to issue through the perforations 21 into the cartridge 8 about the projectile 4. The gases entering the cartridge through the perforations 21, and the gases issuing through the bore 18 of the retaining sleeve 19 work to release the projectile from the cartridge by rupturing the seal at the open end of the cartridge, where the inturned bead engages the projectile, and to thence expell the projectile through the charge bore 2 and shoot it into its trajectory. The radially extending openings 21 and the material of which the container 16 can be selected so that the container does not rupture opposite the radially extending openings. For such construction, the radially extending openings can serve as means communicating the outside and the inside of the axial bore to permit passage of signal material from the axial bore to without the projectile. As is described above, the container 16 following the combustion of the propelling charge fits loosely in the axial bore, so that signal material can pass to the radial openings 21 by passage between the side walls of the container and the side wall of the axial bore, or the construction can be such that upon ignition of the signal charge, the container is forced rearwardly past the radially extending openings, permitting free flow of signalling material through the radially extending bores.

As can be best seen in FIG. 2 and FIG. 3, the signal charge 13 is contained in a container 13*a* which is disposed in the projectile bore 12 intermediate the propelling charge and the warhead of the projectile. The signal charge container 13 has a closure cup 13*b* sealing off the end of the container which is disposed adjacent the propelling charge 11. To suitably isolate the propelling charge 11 from the signal charge 13, these charges are spaced in the bore from each other and a separator sleeve 13*c* is interposed between them.

For detonating of the signal charge upon target impact, a detonator assembly 27*a* is provided. The detonator assembly 27*a* includes the detonator assembly container 27*b* within which is the detonator charge 27. The detonator charge is contained within a detonator charge holder 25, and the holder 25 rests on the detonator charge support 30. A pin 28 is secured to the end of the container adjacent the warhead and serves to detonate the detonator charge upon target impact. The detontator charge in turn sets off the signal charge 13, whereby the position of impact is indicated. For the setting off of the signal charge, the suport 30 is provided with the bore 30*a*, and the signal charge container 15 is provided with the opening 32, whereby to communicate the signal charge with the detonator charge.

The detonator charge assembly includes a safety device for preventing accidental detonation of the detonator charge as might be occasioned by inadvertent dropping of the practice shell. The safety device includes a clamp sleeve 26 which tightly engages the detonator charge holder 25. A coil spring 29 is interposed between the clamp sleeve 26 and the end of the detonator container having the detonating pin 28. The normal position of the coil spring 29 and the clamp sleeve 26 is indicated in FIG. 2. Upon dropping of the cartridge on its warhead, the clamp sleeve, detonator charge holder and detonator charge would move toward the pin, but the pin would not engage the detontator charge as the clamp sleeve would prevent this. Upon firing of the cartridge, however, due to the high shock upon the firing, and the inertia of the parts involved, the clamp sleeve is forced rearwardly relative to

the detonator charge holder 25, so that these parts take the relative position shown in FIG. 3. Then, upon impact of the cartridge with the target (i.e. upon the projectile striking the earth at the conclusion of its trajectory), the detonator charge will move forward into engagement with the pin 28. This will effect the detonation and, in turn, the signal charge 13 will be set off.

In the operation of the charge according to the invention, following striking of the percussion cap 10 of the cartridge 8, the propelling charge 11 ignites. This ruptures the disc 20 and the side wall of the propelling charge container 16 opposite the perforations 21 in the projectile casing 6. Upon the explosion, the side wall of the container 16, due to their elasticity and the forces involved, expand so that the container side walls tightly grip the inner surface of the bore 12. This tends to retain the container 16 in its position in the bore 12 and serves to help isolate the propelling charge from the signal charge 13. The forces resulting from the exploding of the propelling charge shoot off the projectile and place it in its trajectory. After the force of the explosion of the propelling charge has been expanded, the container 16 of the propelling charge retracts from tight-fitting engagement with the bore 12 of the projectile body 6 and the container 16, is then forced rearwardly through the bore 12 following setting off of the signal charge, whereby to communicate the signal charge with the perforations 21 in the casing 6, so that smoke from the signalling charge can issue through the perforations, for observation thereof so as to provide the signalling function. The container 16 of the propelling charge, can be forced axially rearwardly through the bore 12 so that it is completely ejected from the bore, whereupon the signal charge would then communicate with the outside of the projectile by means of the bore 12. The cap 19*a* disposed at the rearward end of the projectile casing 6 is a press-fit, proportioned to yield to the force resulting from the setting off of the signal charge, whereby to permit the described axially rearward movement of the container 16 of the detonator charge. Alternatively, the container 16 can fit loosely in the axial bore of the projectile so that signal material can sweep past the side walls of the container and the side walls of the axial bore, for discharge of the signal material from the projectile.

The condition of the various parts within the bore 12 of the projectile casing 6 before firing is indicated in FIG. 2, and the position of these parts after firing, but before the setting off of the signal charge is indicated in FIG. 3.

The size of the cartridge can be appropriate to the weapon in connection with which the shell is used. A size of 20–50 mm. is preferred. The body 6 can be steel; the axial bore 12 can be 9.7 mm.; the container 16 can have an outside diameter of 9.5 mm.; and the container can be plastic having a side wall thickness of 0.65 mm.

What is claimed is:

1. A cartridge adapted for use as a practice round of ammunition, said cartridge comprising a projectile having a leading end and a trailing end, and an axially extending bore, a signal generating charge disposed in said bore adjacent said leading end and for ignition upon impact of the projectile occurring when the projectile strikes, a propelling charge disposed within the bore adjacent said trailing end and for propelling the projectile into trajectory upon the firing thereof, a container for the propelling charge having an end wall disposed adjacent the signal charge and side walls extending from said end wall toward said trailing end, said container following combustion of the propelling charge fitting loosely in said axial bore to permit passage of signal material from the signal charge through the axial bore toward said trailing end, upon ignition of the signal charge.

2. A cartridge according to claim 1, and including means defining radially extending openings in said pro-

jectile opposite the side walls of the propelling charge container, said openings communicating said bore with the outside of the container for discharge of signal material from the container.

3. A cartridge according to claim 1, releasable retaining means limiting movement of the propelling charge container toward the trailing end of the axial bore, and means for releasing said retaining means following impact of the projectile when the projectile strikes.

4. A cartridge according to claim 1, said container being plastic and fitting loosely in the axial bore prior to ignition of the propelling charge, said container being elastically expandible and under the pressure resulting from ignition of the propelling charge, expanding into tight engagement with the axial bore, and following combustion of the charge contracting to loose fitting relation permitting discharge of signal material as aforesaid.

5. A cartridge according to claim 1, said container fitting loosely in the axial bore prior to ignition of the propelling charge, said container being elastically expandible and under the pressure resulting from ignition of the propelling charge, expanding into tight engagement with the axial bore, and following combustion of the charge contracting to loose fitting relation permitting discharge of signal material as aforesaid.

6. A cartridge according to claim 1, and a casing therefor, said casing including a closed end outfitted with means for engagement by a device for firing the cartridge to secure the casing in such device, and an open end closed by a leading end portion of the projectile, the open end of the cartridge being secured to the projectile for release therefrom in response to the igniting of the propelling charge.

7. A cartridge according to claim 1, and impact sensitive detonating means for igniting the signal charge when the projectile strikes, and safety means for preventing accidental actuation of said detonating means.

8. A cartridge according to claim 1, and including separator means for separating said container and the signal charge.

References Cited by the Examiner

UNITED STATES PATENTS

2,786,415	3/57	Alderson	102—41
3,085,509	4/63	Brandt	102—41

FOREIGN PATENTS

567,455	5/58	Belgium.
693,335	6/53	Great Britain.
767,488	2/57	Great Britain.

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